SEQUENCE LISTING

<110> Marks, James D.
Amersdorfer, Peter

<120> THERAPEUTIC MONOCLONAL ANTIBODIES THAT NEUTRALIZE BOTULINUM NEUROTOXINS

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<210> 37
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Gln Val Lys Leu Gln Gln Ser Gly Ala Glu Leu Val Arg Pro Gly Ala
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Ser Val Lys Leu Ser Cys Lys Thr Ser Gly Tyr Ser Phe Thr Ser Tyr
            20   25   30
Trp Met Asn Trp Val Lys Gln Gly Pro Gly Gln Gly Leu Glu Trp Ile
        35   40   45
Gly Met Ile His Pro Ser Asn Ser Glu Ile Arg Phe Asn Gln Lys Phe
    50   55   60
Glu Asp Met Ala Thr Leu Thr Val Asp Lys Ser Ser Ser Thr Ala Tyr
65   70   75   80

Met Gln Leu Ser Ser Pro Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
                85   90   95
Ala Arg Gly Ile Tyr Tyr Asp Tyr Asp Gly Gly Asn Tyr Tyr Ala Met
            100   105   110
Asp Tyr Trp Gly Gln Gly Thr Thr Val Thr Ala Ser Ser
        115   120   125

<210> 49
<211> 125
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

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Gln Val Lys Leu Gln Gln Ser Gly Ala Glu Leu Val Arg Pro Gly Ala
 1   5   10   15
Ser Val Lys Leu Ser Cys Lys Thr Ser Gly Tyr Ser Phe Thr Ser Tyr
            20   25   30
Trp Met Asn Trp Val Lys Gln Gly Pro Gly Gln Gly Leu Glu Trp Ile
        35   40   45
Gly Met Ile His Pro Ser Asn Ser Glu Ile Arg Phe Asn Gln Lys Phe
    50   55   60
Glu Asn Met Ala Thr Leu Thr Val Asp Lys Ser Ser Ser Thr Ala Tyr
65   70   75   80
Met Gln Leu Ser Ser Pro Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
                85   90   95
Ala Arg Gly Ile Tyr Tyr Val Tyr Asp Gly Gly Asn Tyr Tyr Ala Met
            100   105   110
Asp Tyr Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser
        115   120   125

<210> 50
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<220>
<223> single chain antibody

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Glu Val Lys Leu Val Glu Ser Gly Ala Glu Leu Val Arg Pro Gly Ala
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Ser Val Asn Leu Ser Cys Lys Ala Ser Gly Tyr Ser Phe Thr Ser Tyr
            20   25   30
Trp Met Asn Trp Val Lys Gln Arg Pro Gly Gln Gly Leu Glu Trp Ile
        35   40   45
Gly Met Ile His Pro Ser Asn Ser Glu Thr Arg Leu Asn Gln Lys Phe
    50   55   60
Lys Asp Lys Ala Thr Leu Thr Val Asp Lys Ser Ser Ser Thr Ala Tyr
65   70   75   80
Met Gln Leu Ser Ser Pro Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
                85   90   95
Ala Arg Gly Ile Tyr Tyr Asp Tyr Asp Glu Gly Tyr Tyr Tyr Thr Leu
            100   105   110
Asp Tyr Trp Gly Gln Gly Thr Thr Leu Thr Val Ser Ser
        115   120   125

<210> 51

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<220>
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Ser Val Lys Leu Ser Cys Lys Ala Ser Gly Tyr Ser Phe Thr Ser Tyr
            20   25   30
Trp Met Asn Trp Val Lys Gln Arg Pro Gly Gln Gly Leu Glu Trp Ile
        35   40   45
Gly Met Ile His Pro Ser Asn Ser Asp Thr Arg Phe Asn Gln Lys Phe
    50   55   60
Glu Asp Lys Ala Thr Leu Thr Val Asp Arg Ser Ser Ser Thr Ala Ile
65   70   75   80
His Gln Leu Ser Ser Pro Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
                85   90   95
Ala Arg Gly Leu Tyr Gly Tyr Gly Phe Trp Tyr Phe Asp Val Trp Gly
            100   105   110
Gln Gly Thr Thr Val Thr Val Ser Ser
        115   120

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Ser Val Lys Leu Ser Cys Lys Ala Ser Gly Tyr Ser Leu Thr Ser Tyr
            20   25   30
Trp Met Asn Trp Val Lys Gln Arg Pro Gly Gln Gly Leu Glu Trp Ile
        35   40   45
Gly Met Ile His Pro Ser Asp Ser Asp Thr Arg Phe Asn Gln Lys Phe
    50   55   60
Glu Asp Lys Ala Thr Leu Thr Val Asp Thr Ser Ser Ser Thr Ala Tyr
65   70   75   80
Met Gln Leu Ser Ser Pro Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
                85   90   95
Ala Arg Gly Leu Tyr Asn Gly Phe Trp Tyr Phe Asp Val Trp Gly Gln
            100   105   110
Gly Thr Thr Val Thr Val Ser Ser
        115   120

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Ser Val Lys Ile Ser Cys Lys Ala Ser Gly Tyr Thr Phe Ile Asp Tyr
            20                  25                  30
Ala Met His Trp Val Lys Gln Ser Pro Ala Lys Ser Leu Glu Trp Ile
        35                  40                  45
Gly Val Ile Ser Ser Tyr Tyr Gly Asp Thr Asp Tyr Asn Gln Ile Phe
    50                  55                  60
Lys Gly Lys Ala Thr Leu Thr Val Asp Lys Ser Ser Asn Thr Ala Tyr
65                  70                  75                  80
Met Glu Leu Ala Arg Leu Thr Ser Asp Asp Ser Ala Ile Tyr Tyr Cys
                85                  90                  95
Ala Arg Arg Gly Lys Gly Ala Met Asp Tyr Trp Gly Gln Gly Thr Thr
            100                 105                 110
Val Thr Val Ser Ser
        115


<210> 54
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<220>
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Ser Val Lys Ile Ser Cys Lys Gly Ser Gly Tyr Thr Phe Ile Asp Tyr
            20                  25                  30
Ala Val His Trp Val Lys Gln Ser His Ala Lys Ser Leu Glu Trp Ile
        35                  40                  45
Gly Val Ile Ser Thr Tyr Tyr Gly Asp Ala Asp Tyr Asn Pro Lys Phe
    50                  55                  60
Lys Gly Lys Ala Thr Leu Thr Val Asn Lys Ser Ser Asn Thr Ala Tyr
65                  70                  75                  80
Met Glu Leu Pro Arg Leu Thr Ser Glu Asp Ser Ala Ile Tyr Tyr Cys
                85                  90                  95
Ala Arg Arg Gly Lys Gly Ala Met Asp Tyr Trp Gly Gln Gly Thr Ser
            100                 105                 110
Val Thr Val Ser Ser
        115


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<220>
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Ser Leu Ser Leu Thr Cys Thr Val Thr Gly Tyr Ser Ile Thr Asp Tyr
            20                  25                  30
Ala Trp Asn Trp Ile Arg Gln Phe Pro Gly Lys Lys Leu Glu Trp Met
        35                  40                  45
Gly Tyr Ile Ser Tyr Ser Gly Ser Thr Gly Tyr Asn Pro Ser Leu Lys
    50                  55                  60
Ser Arg Ile Ser Ile Thr Arg Asp Thr Ser Lys Asn Gln Phe Phe Leu
65                  70                  75                  80
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Gln Leu Asn Ser Val Thr Thr Glu Asp Thr Gly Thr Tyr Tyr Cys Ala
            85   90   95
Arg Gly Tyr Asp Ala Met Asp Tyr Trp Gly Gln Gly Thr Ser Val Thr
        100   105   110
Val Ser Ser
    115

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Glu Val Gln Leu Gln Glu Ser Gly Pro Gly Leu Val Lys Pro Ser Gln
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Ser Leu Ser Leu Thr Cys Thr Val Thr Gly Tyr Ser Ile Thr Asp Tyr
            20   25   30
Ala Trp Tyr Trp Ile Arg Gln Phe Pro Gly Lys Lys Leu Glu Trp Met
        35   40   45
Gly Tyr Ile Ser Tyr Ser Gly Ser Thr Gly Tyr Asn Pro Ser Leu Lys
    50   55   60
Ser Arg Ile Ser Ile Thr Arg Asp Thr Ser Lys Asn Gln Phe Phe Leu
65   70   75   80
Gln Leu Asn Ser Val Thr Thr Glu Asp Thr Gly Thr Tyr Tyr Cys Ala
            85   90   95
Arg Gly Tyr Asp Ala Met Asp Tyr Trp Gly Gln Gly Thr Ser Val Thr
        100   105   110
Val Ser Ser
    115

<210> 57
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<220>
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Glu Val Lys Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
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Ser Arg Lys Leu Ser Cys Ala Thr Ser Gly Phe Thr Phe Ser Asp Tyr
            20   25   30
Tyr Met Ser Trp Ile Arg Gln Ser Pro Asp Lys Arg Leu Glu Trp Val
        35   40   45
Ala Thr Ile Ser Asp Gly Gly Thr Tyr Thr Tyr Tyr Pro Asp Ser Val
    50   55   60
Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Thr Leu Tyr
65   70   75   80
Leu Gln Met Ser Ser Leu Lys Ser Glu Asp Thr Ala Met Tyr Tyr Cys
            85   90   95
Val Arg His Gly Tyr Gly Asn Tyr Pro Ser His Trp Tyr Phe Asp Val
        100   105   110
Trp Gly Ala Gly Thr Thr Val Thr Val Ser Ser
    115   120

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Glu Val Lys Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
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Ser Leu Lys Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Asn Tyr
            20   25   30
Gly Met Ser Trp Val Arg Gln Thr Pro Asp Lys Arg Leu Glu Trp Val
        35   40   45
Ala Met Ile Ser Ser Gly Gly Ser Tyr Asn Tyr Tyr Ser Asp Ser Val
    50   55   60
Lys Gly Arg Val Thr Ile Ser Arg Asp Asn Ala Lys Ser Thr Leu Tyr
65   70   75   80
Leu Gln Met Ser Ser Leu Gln Ser Glu Asp Thr Ala Met Tyr Leu Cys
                85   90   95
Thr Arg His Gly Tyr Gly Asn Tyr Pro Ser Tyr Trp Tyr Phe Asp Val
            100   105   110
Trp Gly Ala Gly Thr Thr Val Thr Val Ser Ser
        115   120

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<220>
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Gln Val Gln Leu Gln Glu Ser Gly Gly Gly Ser Val Lys Pro Gly Gly
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Ser Leu Lys Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Asp Tyr
            20   25   30
Tyr Met Ser Trp Val Arg Gln Thr Pro Glu Lys Arg Leu Glu Trp Val
        35   40   45
Ala Thr Ile Ser Asp Gly Gly Ser Tyr Thr Tyr Tyr Pro Asp Ser Val
    50   55   60
Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Asn Leu Tyr
65   70   75   80
Leu Gln Met Ser Ser Leu Lys Ser Glu Asp Thr Ala Ile Tyr Tyr Cys
                85   90   95
Val Arg Tyr Arg Tyr Asp Glu Gly Leu Asp Tyr Trp Gly Gln Gly Thr
            100   105   110
Thr Val Thr Val Ser Ser
        115

<210> 60
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<400> 60
Gln Val Gln Leu Gln Glu Ser Gly Gly Gly Leu Val Lys Pro Gly Gly

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            20                  25                  30
Tyr Met Tyr Trp Val Arg Gln Thr Pro Glu Lys Arg Leu Glu Trp Val
        35                  40                  45
Ala Thr Ile Ser Asp Gly Gly Ser Tyr Thr Tyr Tyr Pro Asp Ser Val
    50                  55                  60
Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Asn Leu Tyr
65                  70                  75                  80
Leu Gln Met Ser Ser Leu Lys Ser Glu Asp Thr Ala Met Tyr Tyr Cys
                85                  90                  95
Ser Arg Tyr Arg Tyr Asp Asp Ala Met Asp Tyr Trp Gly Gln Gly Thr
            100                 105                 110
Thr Val Thr Val Ser Ser
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            20                  25                  30
Ala Met Ser Trp Val Arg Gln Thr Pro Glu Lys Arg Leu Glu Trp Val
        35                  40                  45
Ala Thr Ile Ser Asp Gly Gly Thr Tyr Thr Tyr Tyr Thr Asp Asn Val
    50                  55                  60
Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys His Asn Leu Tyr
65                  70                  75                  80
Leu Gln Met Ser His Leu Lys Ser Glu Asp Thr Ala Met Tyr Tyr Cys
                85                  90                  95
Ala Arg Asn Leu Pro Tyr Asp His Val Asp Tyr Trp Gly Gln Gly Thr
            100                 105                 110
Ser Val Thr Val Ser Ser
        115


<210> 62
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<212> PRT
<213> Artificial Sequence

<220>
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 1               5                  10                  15
Ser Leu Lys Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
            20                  25                  30
Ala Met Ser Trp Val Arg Gln Thr Pro Glu Lys Arg Leu Glu Trp Val
        35                  40                  45
Ala Thr Ile Ser Asp Gly Gly Thr Tyr Thr Tyr Tyr Thr Asp Asn Val
    50                  55                  60
Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys His Asn Leu Tyr
65                  70                  75                  80
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Leu Gln Met Ser His Leu Lys Ser Glu Asp Thr Ala Met Tyr Tyr Cys
                85   90   95
Ala Arg Asn Leu Pro Tyr Asp His Val Asp Tyr Trp Gly Gln Gly Thr
            100   105   110
Ser Val Thr Val Ser Ser
        115

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<220>
<223> single chain antibody

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Glu Gly Lys Leu Val Glu Ser Gly Gly Gly Leu Val Lys Pro Gly Gly
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Ser Leu Lys Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
            20   25   30
Ala Met Ser Trp Val Arg Gln Thr Pro Glu His Arg Leu Glu Trp Val
        35   40   45
Ala Thr Ile Ser Asp Gly Gly Thr Phe Thr Tyr Tyr Thr Asp Asn Val
    50   55   60
Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys His Asn Leu Tyr
65   70   75   80
Leu Gln Met Ser His Leu Lys Ser Glu Asp Thr Ala Met Tyr Tyr Cys
                85   90   95
Ala Arg Asn Leu Pro Tyr Asp His Val Asp Tyr Trp Gly Gln Gly Thr
            100   105   110
Ser Val Thr Val Ser Ser
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<220>
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Glu Val Lys Leu Val Glu Ser Gly Gly Gly Leu Val Lys Pro Gly Gly
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Pro Leu Lys Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
            20   25   30
Ala Met Ser Trp Val Arg Gln Thr Pro Glu His Arg Leu Glu Trp Val
        35   40   45
Ala Thr Ile Ser Asp Gly Gly Thr Phe Thr Tyr Tyr Thr Asp Asn Val
    50   55   60
Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys His Asn Leu Tyr
65   70   75   80
Leu Gln Met Ser His Leu Lys Ser Glu Asp Thr Ala Met Tyr Tyr Cys
                85   90   95
Ala Arg Asn Leu Pro Tyr Asp His Val Asp Tyr Trp Gly Gln Gly Thr
            100   105   110
Ser Val Thr Val Ser Ser
        115

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<220>
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Glu Val Gln Leu Gln Glu Ser Gly Gly Gly Val Val Gln Pro Gly Arg
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Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
            20   25   30
Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
        35   40   45
Ala Val Ile Ser Tyr Asp Gly Ser Asn Lys Tyr Tyr Ala Asp Ser Val
    50   55   60
Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65   70   75   80
Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
                85   90   95
Ala Arg Asp Trp Ser Glu Gly Tyr Tyr Tyr Tyr Gly Met Asp Val Trp
            100   105   110
Gly Gln Gly Thr Thr Val Ile Val Ser Ser
        115   120

<210> 66
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<220>
<223> single chain antibody

<400> 66
Gln Ile Gln Leu Leu Gln Ser Gly Gly Gly Val Val Gln Pro Gly Arg
 1   5   10   15
Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
            20   25   30
Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
        35   40   45
Ala Val Ile Ser Tyr Asp Gly Ser Asn Lys Tyr Tyr Ala Asp Ser Val
    50   55   60
Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65   70   75   80
Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
                85   90   95
Ala Arg Asp Trp Ser Glu Gly Tyr Tyr Tyr Tyr Gly Met Asp Val Trp
            100   105   110
Gly Gln Gly Thr Thr Val Ile Val Ser Ser
        115   120

<210> 67
<211> 121
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 67
Val Lys Leu Val Glu Ser Gly Pro Gly Leu Val Lys Pro Ser Gln Ser

```
 1               5                  10                  15
Leu Ser Leu Thr Cys Thr Val Thr Gly Tyr Ser Ile Thr Ser Asp Tyr
            20                  25                  30
Ala Trp Asn Trp Ile Arg Gln Phe Pro Gly Asn Lys Leu Glu Trp Met
        35                  40                  45
Gly Tyr Ile Asn Tyr Asp Gly Ser Asn Asn Tyr Asn Pro Ser Leu Lys
    50                  55                  60
Asn Arg Ile Ser Ile Thr Arg Asp Thr Ser Lys Asn Gln Phe Phe Leu
65                  70                  75                  80
Lys Leu Asn Ser Val Thr Ser Glu Asp Thr Ala Thr Tyr Tyr Cys Ala
                85                  90                  95
Arg Ala Gly Asp Gly Tyr Tyr Val Asp Trp Tyr Phe Asp Val Trp Gly
            100                 105                 110
Thr Gly Thr Thr Val Ile Val Ser Ser
        115                 120


<210> 68
<211> 117
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 68
Gln Val Gln Leu Gln Gln Ser Gly Ala Glu Leu Val Gln Pro Gly Ala
 1               5                  10                  15
Ser Val Lys Met Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Ser Tyr
            20                  25                  30
Trp Thr Thr Trp Val Lys Gln Arg Pro Gly Gln Gly Leu Glu Trp Ile
        35                  40                  45
Gly Asp Ile Tyr Pro Gly Ser Gly Ser Thr Asn Tyr Asn Glu Lys Phe
    50                  55                  60
Lys Ser Lys Ala Thr Leu Thr Val Asp Thr Ser Ser Ser Thr Ala Tyr
65                  70                  75                  80
Met Gln Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
                85                  90                  95
Ala Arg Glu Leu Gly Asp Ala Met Asp Tyr Trp Gly Gln Gly Thr Ser
            100                 105                 110
Val Ile Val Ser Ser
        115


<210> 69
<211> 117
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 69
Glu Val Gln Leu Gln Gln Ser Gly Ala Glu Leu Val Lys Pro Gly Ala
 1               5                  10                  15
Ser Val Lys Met Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Ser Tyr
            20                  25                  30
Trp Thr Thr Trp Val Lys Gln Arg Pro Gly Gln Gly Leu Glu Trp Ile
        35                  40                  45
Gly Asp Ile Tyr Pro Asp Ser Gly Ser Thr Asn Tyr Asn Glu Lys Phe
    50                  55                  60
Lys Ser Lys Ala Thr Leu Thr Val Asp Thr Ser Ser Ser Thr Ala Tyr
65                  70                  75                  80
```

Met Gln Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
                85   90   95
Ala Arg Glu Leu Gly Asp Ala Met Asp Tyr Trp Gly Gln Gly Thr Ser
            100   105   110
Val Ile Val Ser Ser
        115

<210> 70
<211> 119
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 70
Glu Val Gln Leu Gln Gln Ser Gly Ala Glu Leu Val Lys Pro Gly Ala
 1   5   10   15
Ser Val Lys Leu Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Ser Phe
            20   25   30
Trp Met His Trp Val Lys Gln Arg Pro Gly Arg Gly Leu Glu Trp Ile
        35   40   45
Gly Arg Leu Asp Pro Asn Ser Gly Glu Thr Lys Tyr Asn Glu Lys Phe
    50   55   60
Lys Ser Lys Ala Thr Leu Thr Val Asp Lys Pro Ser Ser Thr Ala Tyr
65   70   75   80
Met Glu Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
                85   90   95
Ala Arg Glu Ala Tyr Gly Tyr Trp Asn Phe Asp Val Trp Gly Thr Gly
            100   105   110
Thr Thr Val Thr Val Ser Ser
        115

<210> 71
<211> 119
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 71
Glu Val Gln Leu Gln Gln Ser Gly Ala Glu Leu Val Lys Pro Gly Ala
 1   5   10   15
Ser Val Lys Leu Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Ser Phe
            20   25   30
Trp Met His Trp Val Lys Gln Arg Pro Gly Arg Gly Leu Glu Trp Ile
        35   40   45
Gly Arg Leu Asp Pro Asn Ser Gly Glu Thr Lys Tyr Asn Lys Lys Phe
    50   55   60
Lys Ser Lys Ala Thr Leu Thr Val Asp Lys Pro Ser Ser Thr Ala Tyr
65   70   75   80
Met Glu Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
                85   90   95
Ala Arg Glu Ala Tyr Gly Tyr Trp Asn Phe Asp Val Trp Gly Thr Gly
            100   105   110
Thr Thr Val Thr Val Ser Ser
        115

<210> 72

<211> 107
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 72
Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
 1   5   10   15
Glu Lys Val Ile Met Thr Cys Ser Ala Ser Ser Ser Val Ser His Met
            20   25   30
Tyr Trp Tyr Gln Gln Lys Pro Gly Ser Ser Pro Arg Leu Leu Ile Tyr
        35   40   45
Asp Thr Ser Asn Leu Ala Ser Gly Val Pro Ile Arg Phe Ser Gly Ser
    50   55   60
Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Arg Met Glu Ala Glu
65   70   75   80
Asp Ser Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Tyr Pro Phe Thr
                85   90   95
Phe Gly Ser Gly Thr Lys Leu Glu Leu Lys Arg
            100   105

<210> 73
<211> 107
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 73
Asp Ile Asp Leu Thr Gln Ser Pro Ala Ile Met Ser Ser Ser Pro Gly
 1   5   10   15
Glu Lys Val Ile Ile Thr Cys Ser Ala Ser Ser Ser Val Ser Tyr Met
            20   25   30
His Trp Phe Gln Gln Lys Pro Gly Thr Ser Pro Lys Pro Trp Ile Tyr
        35   40   45
Ser Thr Ser Asn Leu Ala Ser Gly Val Pro Ala Arg Phe Ser Gly Ser
    50   55   60
Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Ser Val Glu Ala Glu
65   70   75   80
Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Tyr Ser Gly Tyr Pro Leu Thr
                85   90   95
Phe Gly Ala Gly Thr Lys Leu Glu Ile Lys Arg
            100   105

<210> 74
<211> 109
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 74
Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ala Ala Ser Pro Gly
 1   5   10   15
Glu Lys Val Ile Ile Thr Cys Ser Ala Ser Ser Ser Ile Ser Ser Ser
            20   25   30
Asn Leu His Trp Tyr Gln Gln Lys Ser Glu Thr Ser Pro Lys Pro Trp

```
        35                  40                  45
Ile Tyr Gly Thr Ser Asn Leu Ala Ser Gly Val Pro Val Arg Phe Ser
    50                  55                  60
Gly Ser Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Ser Met Glu
65                  70                  75                  80
Ala Glu Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Gly Ser Tyr Pro
                85                  90                  95
Leu Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Arg
            100                 105


<210> 75
<211> 107
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 75
Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
 1               5                  10                  15
Glu Lys Val Ile Met Thr Cys Ser Ala Ser Ser Ser Val Ser Tyr Met
            20                  25                  30
Tyr Trp Tyr Gln Gln Lys Pro Gly Ser Ser Pro Arg Leu Leu Ile Tyr
        35                  40                  45
Asp Thr Ser Asn Leu Ala Ser Gly Val Pro Val Arg Phe Ser Gly Ser
    50                  55                  60
Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Arg Met Glu Ala Glu
65                  70                  75                  80
Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Tyr Pro Leu Thr
                85                  90                  95
Phe Gly Ala Gly Thr Lys Leu Glu Leu Lys Arg
            100                 105


<210> 76
<211> 109
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 76
Asp Ile Glu Leu Thr Gln Ser Pro Ala Leu Met Ala Ala Ser Pro Gly
 1               5                  10                  15
Glu Lys Val Ile Ile Thr Cys Ser Val Ser Ser Ser Ile Ser Ser Ser
            20                  25                  30
Asn Leu His Trp Tyr Gln Gln Lys Ser Gly Thr Ser Pro Lys Pro Trp
        35                  40                  45
Ile Tyr Gly Thr Ser Asn Leu Ala Ser Gly Val Pro Val Arg Phe Ser
    50                  55                  60
Gly Ser Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Ser Met Glu
65                  70                  75                  80
Ala Glu Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Tyr Pro
                85                  90                  95
Leu Thr Phe Gly Ala Gly Thr Lys Leu Glu Ile Lys Arg
            100                 105


<210> 77
<211> 112
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<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 77
Asp Ile Glu Leu Thr Gln Ser Pro Ala Ser Leu Ala Val Ser Leu Gly
 1   5   10   15
Gln Arg Ala Ile Ile Ser Cys Arg Ala Ser Glu Ser Val Asp Ser Tyr
            20   25   30
Gly Asn Ser Phe Met His Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
        35   40   45
Lys Leu Leu Ile Tyr Arg Ala Ser Asn Leu Glu Ser Gly Ile Pro Ala
    50   55   60
Arg Phe Ser Gly Ser Gly Ser Arg Thr Asp Phe Thr Leu Thr Ile Asn
65   70   75   80
Pro Val Glu Ala Asp Asp Val Ala Thr Tyr Tyr Cys Gln Gln Ser Asn
                85   90   95
Glu Asp Pro Pro Thr Phe Gly Ala Gly Thr Lys Leu Glu Leu Lys Arg
            100   105   110

<210> 78
<211> 112
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 78
Asp Ile Glu Leu Thr Gln Ser Pro Ala Ser Leu Ala Val Ser Leu Gly
 1   5   10   15
Gln Arg Ala Ile Ile Ser Cys Arg Ala Ser Glu Ser Val Asp Ser Tyr
            20   25   30
Gly Asn Ser Phe Met His Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
        35   40   45
Lys Leu Leu Ile Tyr Arg Ala Ser Asn Leu Glu Gly Gln Ile Pro Ala
    50   55   60
Arg Phe Ser Gly Ser Gly Ser Arg Thr Asp Phe Thr Leu Thr Ile Asn
65   70   75   80
Pro Val Glu Ala Asp Asp Val Ala Thr Tyr Tyr Cys Gln Gln Ser Asn
                85   90   95
Glu Asp Pro Tyr Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Arg
            100   105   110

<210> 79
<211> 107
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 79
Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
 1   5   10   15
Glu Lys Val Ile Met Thr Cys Ser Ala Ser Ser Ser Val Ser Tyr Met
            20   25   30
His Trp Tyr Gln Gln Lys Ser Gly Thr Ser Pro Lys Arg Trp Ile Tyr
        35   40   45

Asp Thr Ser Lys Leu Ala Ser Gly Val Pro Ala Arg Phe Ser Gly Ser
50 55 60
Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Ser Met Glu Ala Glu
65 70 75 80
Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Asn Pro Leu Thr
85 90 95
Phe Gly Ala Gly Thr Lys Leu Glu Leu Lys Arg
100 105

<210> 80
<211> 107
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 80
Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
1 5 10 15
Glu Lys Val Ile Met Thr Cys Ser Ala Ser Ser Ser Val Ser Tyr Met
20 25 30
His Trp Tyr Gln Gln Lys Ser Gly Thr Ser Pro Lys Arg Trp Ile Tyr
35 40 45
Asp Thr Ser Lys Leu Ala Ser Gly Val Pro Ala Arg Phe Ser Gly Ser
50 55 60
Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Ser Met Glu Ala Glu
65 70 75 80
Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Asn Pro Leu Thr
85 90 95
Phe Gly Ala Gly Thr Lys Leu Glu Leu Lys Arg
100 105

<210> 81
<211> 112
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 81
Asp Ile Glu Leu Thr Gln Ser Pro Ala Ser Leu Ala Val Ser Leu Gly
1 5 10 15
Gln Arg Ala Thr Ile Ser Cys Arg Ala Ser Glu Ser Val Asp Ser Tyr
20 25 30
Gly Asn Ser Phe Met His Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
35 40 45
Lys Leu Leu Ile Tyr Leu Ala Ser Asn Leu Glu Ser Gly Val Pro Ala
50 55 60
Arg Phe Ser Gly Ser Gly Ser Arg Thr Asp Phe Thr Leu Thr Ile Asp
65 70 75 80
Pro Val Glu Ala Asp Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Asn Asn
85 90 95
Glu Asp Pro Tyr Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Arg
100 105 110

<210> 82
<211> 112
<212> PRT

<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 82
Asp Ile Glu Leu Thr Gln Ser Pro Thr Ser Leu Ala Val Ser Leu Gly
 1   5   10   15
Gln Arg Ala Thr Ile Ser Cys Arg Ala Ser Glu Ser Val Asp Ser Tyr
            20   25   30
Gly Asn Ser Phe Met His Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
        35   40   45
Lys Leu Leu Ile Tyr Leu Ala Ser Asn Leu Glu Ser Gly Val Pro Ala
    50   55   60
Arg Phe Ser Gly Ser Gly Ser Arg Thr Asp Phe Thr Leu Thr Ile Asp
65   70   75   80
Pro Val Glu Ala Asp Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Asn Asn
                85   90   95
Glu Asp Pro Tyr Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Arg
            100   105   110

<210> 83
<211> 112
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 83
Asp Ile Glu Leu Thr Gln Ser Pro Ala Ser Leu Ala Val Ser Leu Gly
 1   5   10   15
Arg Arg Ala Thr Ile Ser Cys Arg Ala Ser Glu Ser Val Asp Ser Tyr
            20   25   30
Gly His Ser Phe Met His Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
        35   40   45
Lys Leu Leu Ile Tyr Leu Ala Ser Asn Leu Glu Ser Gly Val Pro Ala
    50   55   60
Arg Phe Ser Gly Ser Gly Ser Arg Thr Asp Phe Thr Leu Thr Ile Asp
65   70   75   80
Pro Val Glu Ala Asp Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Asn Asn
                85   90   95
Glu Asp Pro Tyr Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Arg
            100   105   110

<210> 84
<211> 112
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 84
Asp Ile Glu Leu Thr Gln Ser Pro Ala Ser Leu Ala Val Ser Leu Gly
 1   5   10   15
Gln Arg Ala Thr Ile Ser Cys Arg Ala Ser Glu Ser Val Asp Ser Tyr
            20   25   30
Gly His Ser Phe Met Gln Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
        35   40   45
Lys Leu Leu Ile Tyr Arg Ala Ser Asn Leu Glu Pro Gly Ile Pro Ala

```
    50                  55                  60
Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Asn
65                  70                  75                  80
Pro Val Glu Ala Asp Asp Val Ala Thr Tyr Tyr Cys Gln Gln Ser Asn
                85                  90                  95
Glu Asp Pro Phe Thr Phe Gly Ser Gly Thr Lys Leu Glu Ile Lys Arg
            100                 105                 110


<210> 85
<211> 107
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 85
Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
 1               5                  10                  15
Glu Lys Val Thr Thr Thr Cys Ser Ala Ser Ser Ser Val Ser Tyr Met
            20                  25                  30
Gly Trp Phe Gln Gln Lys Pro Gly Thr Ser Pro Lys Leu Trp Ile Tyr
        35                  40                  45
Ser Thr Ser Asn Leu Ala Ser Gly Val Pro Ala Arg Phe Ser Gly Ser
    50                  55                  60
Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Arg Met Glu Ala Glu
65                  70                  75                  80
Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Arg Ser Ser Tyr Pro Tyr Thr
                85                  90                  95
Phe Gly Ser Gly Asp Gln Ala Gly Asn Lys Ser
            100                 105


<210> 86
<211> 112
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 86
Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
 1               5                  10                  15
Glu Lys Val Thr Thr Thr Cys Arg Ala Ser Glu Ser Val Asp Ser Tyr
            20                  25                  30
Gly His Ser Phe Met Gln Trp Phe Gln Gln Lys Pro Gly Thr Ser Pro
        35                  40                  45
Lys Leu Trp Ile Tyr Ser Thr Ser Asn Leu Ala Ser Gly Val Pro Ala
    50                  55                  60
Arg Phe Ser Gly Ser Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser
65                  70                  75                  80
Arg Met Glu Ala Glu Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Arg Ser
                85                  90                  95
Ser Tyr Pro Tyr Thr Phe Gly Ser Gly Asp Gln Ala Gly Asn Lys Arg
            100                 105                 110


<210> 87
<211> 107
<212> PRT
<213> Artificial Sequence
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<220>
<223> single chain antibody

<400> 87
Asp Thr Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
 1   5   10   15
Glu Lys Val Thr Met Thr Cys Ser Ala Ser Ser Ser Val Ser Tyr Met
            20   25   30
Tyr Trp Tyr Gln Gln Lys Pro Gly Ser Ser Pro Arg Leu Leu Ile Tyr
        35   40   45
Asp Thr Ser Asn Leu Ala Ser Gly Val Pro Val Arg Phe Ser Gly Ser
    50   55   60
Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Arg Met Glu Ala Glu
65   70   75   80
Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Tyr Pro Pro Thr
                85   90   95
Phe Gly Ser Gly Thr Lys Leu Glu Ile Lys Arg
            100   105

<210> 88
<211> 109
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 88
Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
 1   5   10   15
Glu Lys Val Thr Met Thr Cys Arg Ala Ser Ser Ser Val Ser Ser Ser
            20   25   30
Tyr Leu Gly Trp Tyr Gln Gln Lys Pro Gly Ser Ser Pro Arg Leu Leu
        35   40   45
Ile Tyr Asp Thr Ser Asn Leu Ala Ser Gly Val Pro Val Arg Phe Ser
    50   55   60
Gly Ser Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Arg Met Glu
65   70   75   80
Ala Glu Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Tyr Pro
                85   90   95
Pro Thr Phe Gly Ser Gly Thr Lys Leu Glu Ile Lys Arg
            100   105

<210> 89
<211> 109
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 89
Asp Ser Glu Leu Thr Gln Ser Pro Thr Thr Met Ala Ala Ser Pro Gly
 1   5   10   15
Glu Lys Ile Thr Thr Thr Cys Ser Ala Ser Ser Ser Ile Ser Ser Asn
            20   25   30
Tyr Leu His Trp Tyr Gln Gln Arg Pro Gly Phe Ser Pro Lys Leu Leu
        35   40   45
Ile Tyr Arg Thr Ser Asn Leu Ala Ser Gly Val Pro Ala Arg Phe Ser
    50   55   60

Gly Ser Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Gly Thr Met Glu
65   70   75   80
Ala Glu Asp Val Ala Thr Tyr Tyr Cys Gln Gln Gly Ser Ser Ile Pro
                85   90   95
Arg Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Arg
            100   105

<210> 90
<211> 111
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 90
Asp Ile Glu Leu Thr Gln Ser Pro Ala Ser Leu Ala Val Ser Leu Gly
 1   5   10   15
Arg Arg Ala Thr Thr Ser Cys Arg Ala Ser Glu Ser Val Glu Tyr Tyr
            20   25   30
Gly Thr Ser Leu Met Gln Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
        35   40   45
Lys Leu Leu Ile Tyr Ala Ala Ser Asn Val Glu Ser Gly Val Pro Ala
    50   55   60
Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Ser Leu Asn Ile His
65   70   75   80
Pro Val Glu Glu Asp Ile Ala Met Tyr Phe Cys Gln Gln Ser Arg Lys
                85   90   95
Val Pro Trp Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Arg
            100   105   110

<210> 91
<211> 112
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 91
Tyr Ile Glu Leu Thr Gln Ser Pro Ala Ser Leu Ala Val Ser Leu Gly
 1   5   10   15
Gln Arg Ala Thr Thr Ser Cys Arg Ala Ser Glu Ser Val Asp Ser Tyr
            20   25   30
Gly Asn Ser Phe Met His Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
        35   40   45
Lys Leu Leu Ile Tyr Leu Ala Ser Asn Leu Glu Ser Gly Val Pro Ala
    50   55   60
Arg Phe Ser Gly Ser Gly Ser Arg Thr Asp Phe Thr Leu Thr Ile Asp
65   70   75   80
Pro Val Glu Ala Asp Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Asn Asn
                85   90   95
Glu Asp Pro Tyr Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Ser
            100   105   110

<210> 92
<211> 112
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 92
Asp Ile Glu Leu Thr Gln Ser Pro Ala Ser Leu Ala Val Ser Leu Gly
 1   5   10   15
Gln Arg Ala Thr Thr Ser Cys Arg Ala Ser Glu Ser Val Glu Tyr Tyr
            20   25   30
Gly Thr Ser Leu Met Gln Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
        35   40   45
Lys Leu Leu Ile Tyr Ala Ala Ser Asn Val Glu Ser Gly Ala Pro Ala
    50   55   60
Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Ser Leu Asn Ile His
65   70   75   80
Pro Val Glu Glu Asp Asp Ile Ala Met Tyr Phe Cys Gln Gln Ser Arg
                85   90   95
Lys Val Pro Tyr Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Arg
            100   105   110

<210> 93
<211> 109
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 93
Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
 1   5   10   15
Glu Lys Val Thr Thr Thr Cys Ser Val Ser Ser Ser Ile Ser Ser Ser
            20   25   30
Asn Leu His Trp Tyr Gln Gln Lys Ser Gly Thr Ser Pro Lys Leu Trp
        35   40   45
Ile Tyr Gly Thr Ser Asn Leu Ala Ser Gly Val Pro Val Arg Phe Ser
    50   55   60
Gly Ser Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Ser Met Glu
65   70   75   80
Ala Glu Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Tyr Pro
                85   90   95
Leu Thr Phe Gly Ala Gly Thr Lys Val Glu Leu Arg Arg
            100   105

<210> 94
<211> 109
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 94
Asp Ile Glu Leu Thr Gln Ser Pro Ala Ser Met Ser Ala Ser Pro Gly
 1   5   10   15
Glu Lys Val Thr Met Thr Cys Arg Ala Thr Ser Ser Val Ser Ser Ser
            20   25   30
Tyr Leu His Trp Tyr Gln Gln Lys Ser Gly Ala Ser Pro Lys Leu Trp
        35   40   45
Ile Tyr Ser Ala Ser Asn Leu Ala Ser Gly Val Pro Ser Arg Phe Ser
    50   55   60
Gly Ser Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Ser Val Glu

65 70 75 80
Ala Glu Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Tyr Ile Gly Tyr Pro
85 90 95
Tyr Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Arg
100 105

<210> 95
<211> 109
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody

<400> 95
Asp Ile Glu Leu Thr Gln Ser Pro Thr Thr Met Ala Ala Ser Pro Gly
1 5 10 15
Glu Lys Ile Thr Ile Thr Cys Ser Ala Ser Ser Ser Ile Gly Ser Asn
20 25 30
Tyr Leu His Trp Tyr Gln Gln Lys Pro Gly Phe Ser Pro Lys Leu Leu
35 40 45
Ile Tyr Arg Thr Ser Asn Leu Ala Ser Gly Val Pro Ala Arg Phe Ser
50 55 60
Gly Ser Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Gly Ala Met Glu
65 70 75 80
Ala Glu Asp Val Ala Thr Tyr Tyr Cys Gln Gln Gly Ser Ser Ile Pro
85 90 95
Tyr Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Arg
100 105

<210> 96
<211> 36
<212> DNA
<213> Artificial Sequence

<220>
<223> oligonucleotide primer

<400> 96
gtctcctgag ctagctgagg agacggtgac cgtggt 36

<210> 97
<211> 42
<212> DNA
<213> Artificial Sequence

<220>
<223> oligonucleotide primer

<400> 97
gtaccaacgc gtgtcttgtc ccaggtccag ctgcaggagt ct 42

<210> 98
<211> 42
<212> DNA
<213> Artificial Sequence

<220>
<223> oligonucleotide primer

<400> 98

gtaccaacgc gtgtcttgtc ccaggtgaag ctgcagcagt ca 42

<210> 99
<211> 42
<212> DNA
<213> Artificial Sequence

<220>
<223> oligonucleotide primer

<400> 99
gtaccaacgc gtgtcttgtc ccaggtgcag ctggtgcagt ct 42

<210> 100
<211> 54
<212> DNA
<213> Artificial Sequence

<220>
<223> oligonucleotide primer

<400> 100
tcagtcgttg catgtactcc aggtgcacga tgtgacatcg agctcactca gtct 54

<210> 101
<211> 36
<212> DNA
<213> Artificial Sequence

<220>
<223> oligonucleotide primer

<400> 101
ctggaaatca aacgtacgtt ttatttccag cttggt 36

<210> 102
<211> 54
<212> DNA
<213> Artificial Sequence

<220>
<223> oligonucleotide primer

<400> 102
tcagtcgttg catgtactcc aggtgcacga tgtgacatcg agctcactca gtct 54

<210> 103
<211> 36
<212> DNA
<213> Artificial Sequence

<220>
<223> oligonucleotide primer

<400> 103
ctggaaatca aacgtacgtt tgatttccag cttggt 36

<210> 104
<211> 54
<212> DNA
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<220>

<223> oligonucleotide primer

<400> 104
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<210> 105
<211> 36
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<220>
<223> oligonucleotide primer

<400> 105
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<210> 106
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 1 5

<210> 107
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<220>
<223> single chain antibody fragment

<400> 107
Asn Gly Asp Pro Glu Ala Phe Asp Tyr
 1 5

<210> 108
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Ala Leu Gln Ser Asp Ser Pro Tyr Phe Asp
 1 5 10

<210> 109
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<220>
<223> single chain antibody fragment

<400> 109
Asp Leu Ala Ile Phe Ala Gly Asn Asp Tyr
 1   5   10

<210> 110
<211> 11
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Val Gly Val Asp Arg Trp Tyr Pro Ala Asp Tyr
 1   5   10

<210> 111
<211> 12
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<220>
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<400> 111
Asp Leu Leu Asp Gly Ser Gly Ala Tyr Phe Asp Tyr
 1   5   10

<210> 112
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<220>
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Asp Leu Asp Tyr Gly Gly Asn Ala Gly Tyr Phe Asp Leu
 1   5   10

<210> 113
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<212> PRT
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<400> 113
Asp Leu Asp Tyr Gly Gly Asn Ala Gly Tyr Phe Asp Leu
 1   5   10

<210> 114
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<220>

<223> single chain antibody fragment

<400> 114
Asp Tyr Thr Ala Asn Tyr Tyr Tyr Tyr Gly Met Asp Val
 1   5   10

<210> 115
<211> 15
<212> PRT
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<220>
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<400> 115
Asp Leu Gly Tyr Gly Ser Gly Thr Ser Ser Tyr Tyr Leu Asp Tyr
 1   5   10   15

<210> 116
<211> 9
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<220>
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<400> 116
Gln Gln Ala Asn Ser Phe Pro Arg Thr
 1   5

<210> 117
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<220>
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<400> 117
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<210> 118
<211> 11
<212> PRT
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<220>
<223> single chain antibody fragment

<400> 118
Asn Ser Arg Asp Ser Ser Gly Asn His Val Val
 1   5   10

<210> 119
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 1   5   10

<210> 120
<211> 9
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<220>
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<400> 120
Gln Gln Tyr His Thr Ile Ser Arg Thr
 1   5

<210> 121
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<400> 121
Asn Ser Arg Asp Ser Ser Gly Asn His Val Val
 1   5   10

<210> 122
<211> 11
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<400> 123
Asn Ser Arg Asp Ser Ser Gly Asn His Gln Val
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<400> 124
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<400> 125
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 1   5   10

<210> 126
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<400> 126
Leu Ala Thr Tyr Tyr Tyr Phe Gly Leu Asp Val
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<220>
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<400> 127
Leu Ala Thr Tyr Tyr Tyr Phe Gly Leu Asp Val
 1   5   10

<210> 128
<211> 11
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<220>
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<400> 128
Gly Pro Trp Glu Leu Val Gly Tyr Phe Asp Ser
 1   5   10

<210> 129
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<212> PRT
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<220>
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<400> 129
Glu Pro Asp Trp Leu Leu Trp Gly Asp Arg Gly Ala Leu Asp Val
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<210> 130
<211> 15
<212> PRT
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<220>
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<400> 130
Glu Pro Asp Trp Leu Leu Trp Gly Asp Arg Gly Ala Leu Asp Val
 1   5   10   15

<210> 131
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<212> PRT
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<220>
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<400> 131
Glu Pro Asp Trp Leu Leu Trp Gly Asp Arg Gly Ala Leu Asp Val
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<210> 132
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<400> 132
Gln Gln Tyr Asn Ser Tyr Val Tyr Thr
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<210> 133
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<400> 133
Gln Gln Leu Asn Ser Tyr Pro Leu Thr
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<210> 134
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<220>
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<400> 134
Gln Gln Leu Ile Ser Tyr Pro Leu Thr
 1   5

<210> 135
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<220>
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<400> 135
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 1   5

<210> 136
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<212> PRT
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<400> 136
Gln His Tyr Asn Thr Tyr Pro Tyr Thr
 1   5

<210> 137
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<220>
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<400> 137
Gln His Tyr Asn Thr Tyr Pro Tyr Thr
 1   5

<210> 138
<211> 30
<212> PRT
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<220>
<223> single chain antibody fragment

<400> 138

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            20                  25                  30


<210> 139
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody fragment

<400> 139
Asp Tyr Tyr Met Tyr
 1               5


<210> 140
<211> 14
<212> PRT
<213> Artificial Sequence

<220>
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<400> 140
Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val Ala
 1               5                  10


<210> 141
<211> 17
<212> PRT
<213> Artificial Sequence

<220>
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<400> 141
Thr Ile Ser Asp Gly Gly Ser Tyr Thr Tyr Tyr Pro Asp Ser Val Lys
 1               5                  10                  15
Gly



<210> 142
<211> 30
<212> PRT
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<220>
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<400> 142
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 1               5                  10                  15
Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser
            20                  25                  30


<210> 143
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<211> 5
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<400> 143
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<400> 144
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 1   5   10

<210> 145
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<212> PRT
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<220>
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<400> 145
Thr Ile Ser Asp Gly Gly Ser Tyr Thr Tyr Tyr Pro Asp Ser Val Lys
 1   5   10   15
Gly

<210> 146
<211> 30
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<220>
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<400> 146
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Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser
            20   25   30

<210> 147
<211> 5
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<220>
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<400> 147
Asp His Tyr Met Tyr
 1   5

<210> 148
<211> 14
<212> PRT
<213> Artificial Sequence

<220>
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<400> 148
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 1   5   10

<210> 149
<211> 17
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<220>
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<400> 149
Thr Ile Ser Asp Gly Gly Ser Tyr Thr Tyr Tyr Pro Asp Ser Val Lys
 1   5   10   15
Gly

<210> 150
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<220>
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<400> 150
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 1   5   10   15
Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Ser Ser
            20   25   30

<210> 151
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<220>
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<400> 151
Asp His Tyr Met Tyr
 1   5

<210> 152
<211> 14

<212> PRT
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<220>
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<400> 152
Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val Ala
 1   5   10

<210> 153
<211> 17
<212> PRT
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<220>
<223> single chain antibody fragment

<400> 153
Thr Ile Ser Asp Gly Gly Ser Tyr Thr Tyr Tyr Pro Asp Ser Val Lys
 1   5   10   15
Gly

<210> 154
<211> 30
<212> PRT
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<220>
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<400> 154
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Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Ser Ser
            20   25   30

<210> 155
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<220>
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<400> 155
Asp His Tyr Met Tyr
 1   5

<210> 156
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<220>
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<400> 156

Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val Ala
 1   5   10

<210> 157
<211> 17
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<220>
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<400> 157
Thr Ile Ser Asp Gly Gly Ser Tyr Thr Tyr Tyr Pro Asp Ser Val Lys
 1   5   10   15
Gly

<210> 158
<211> 30
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody fragment

<400> 158
Gln Val Gln Leu Val Gln Ser Gly Gly Gly Val Val His Pro Gly Arg
 1   5   10   15
Ser Leu Lys Leu Ser Cys Ala Gly Ser Gly Phe Thr Phe Ser
            20   25   30

<210> 159
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<220>
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<400> 159
Asp Tyr Asp Met His
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<210> 160
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<400> 160
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<210> 161
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<400> 161
Val Met Trp Phe Asp Gly Thr Glu Lys Tyr Ser Ala Glu Ser Val Lys
 1   5   10   15
Gly

<210> 162
<211> 30
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<220>
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<400> 162
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 1   5   10   15
Ser Leu Lys Leu Ser Cys Ala Gly Ser Gly Phe Thr Phe Ser
            20   25   30

<210> 163
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<400> 163
Asp Tyr Asp Met His
 1   5

<210> 164
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<400> 164
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 1   5   10

<210> 165
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<400> 165
Val Met Trp Phe Asp Gly Thr Glu Lys Tyr Ser Ala Glu Ser Val Lys

1 5 10 15
Gly

<210> 166
<211> 30
<212> PRT
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<220>
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<400> 166
Gln Val Gln Leu Val Gln Ser Gly Gly Gly Val Val His Pro Gly Arg
1 5 10 15
Ser Leu Lys Leu Ser Cys Ala Gly Ser Gly Phe Thr Phe Ser
20 25 30

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<211> 5
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<213> Artificial Sequence

<220>
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<400> 167
Asp Tyr Asp Met His
1 5

<210> 168
<211> 14
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<400> 168
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1 5 10

<210> 169
<211> 17
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<220>
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<400> 169
Val Ile Trp Phe Asp Gly Thr Glu Lys Tyr Ser Ala Glu Ser Val Lys
1 5 10 15
Gly

<210> 170
<211> 30

<212> PRT
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<220>
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            20   25   30

<210> 171
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<220>
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<400> 171
Asp Tyr Asp Met His
 1   5

<210> 172
<211> 14
<212> PRT
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<220>
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<400> 172
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 1   5   10

<210> 173
<211> 17
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<220>
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<400> 173
Val Met Trp Phe Asp Gly Thr Glu Lys Tyr Ser Ala Glu Ser Val Lys
 1   5   10   15
Gly

<210> 174
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<220>
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<400> 174

Gln Val Gln Leu Gln Gln Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
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            20   25   30

<210> 175
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<400> 175
Asn Tyr Ala Met Thr
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<210> 176
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<220>
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Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val Ser
 1   5   10

<210> 177
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<220>
<223> single chain antibody fragment

<400> 177
Ser Ile Ser Val Gly Gly Ser Asp Thr Tyr Tyr Ala Asp Ser Val Lys
 1   5   10   15
Gly

<210> 178
<211> 32
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody fragment

<400> 178
Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr Leu Gln
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            20   25   30

<210> 179

<211> 9
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody fragment

<400> 179
Tyr Arg Tyr Asp Asp Ala Met Asp Tyr
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<210> 180
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<212> PRT
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<220>
<223> single chain antibody fragment

<400> 180
Trp Gly Gln Gly Thr Leu Val Thr Val Ser Ser
 1   5   10

<210> 181
<211> 32
<212> PRT
<213> Artificial Sequence

<220>
<223> single chain antibody fragment

<400> 181
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 1   5   10   15
Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Ile Tyr Tyr Cys Ser Arg
            20   25   30

<210> 182
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<220>
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<400> 182
Tyr Arg Tyr Asp Asp Ala Met Asp Tyr
 1   5

<210> 183
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<212> PRT
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<400> 183
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1 5 10

<210> 184
<211> 32
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<220>
<223> single chain antibody fragment

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Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Ile Tyr Tyr Cys Ser Arg
20 25 30

<210> 185
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<400> 185
Tyr Arg Tyr Asp Asp Ala Met Asp Tyr
1 5

<210> 186
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<400> 186
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1 5 10

<210> 187
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<400> 187
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Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Ile Tyr Tyr Cys Ser Arg
20 25 30

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<400> 188
Tyr Arg Tyr Asp Asp Ala Met Asp Tyr
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<210> 189
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Trp Gly Gln Gly Thr Leu Val Thr Val Ser Ser
 1   5   10

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<400> 190
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            20   25   30

<210> 191
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<213> Artificial Sequence

<220>
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<400> 191
Tyr Arg Tyr Asp Asp Ala Met Asp Tyr
 1   5

<210> 192
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
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<400> 192
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 1   5   10

<210> 193
<211> 32
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<213> Artificial Sequence

<220>
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<400> 193
Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Phe Leu Gln
 1   5   10   15
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            20   25   30

<210> 194
<211> 15
<212> PRT
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<220>
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<400> 194
Glu Pro Asp Trp Leu Leu Trp Gly Asp Arg Gly Ala Leu Asp Val
 1   5   10   15

<210> 195
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
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<400> 195
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 1   5   10

<210> 196
<211> 32
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<400> 196
Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Phe Leu Gln
 1   5   10   15
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            20   25   30

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<400> 197
Glu Pro Asp Trp Leu Leu Trp Gly Asp Arg Gly Ala Leu Asp Val
 1   5   10   15

<210> 198
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<220>
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<400> 198
Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser
 1   5   10

<210> 199
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<400> 199
Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Phe Leu Gln
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            20   25   30

<210> 200
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<400> 200
Glu Pro Asp Trp Leu Leu Trp Gly Asp Arg Gly Ala Leu Asp Val
 1   5   10   15

<210> 201
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<400> 201
Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser
 1   5   10

<210> 202
<211> 32
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<213> Artificial Sequence

<220>
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<400> 202
Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Phe Leu Gln
 1   5   10   15
Met Asn Ser Leu Arg Ala Asp Asp Thr Ala Val Tyr Tyr Cys Ala Arg
            20   25   30

<210> 203
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<400> 203
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<210> 204
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<400> 204
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<210> 205
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<400> 205
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Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys Ala Lys
            20   25   30

<210> 206
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<220>
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<400> 206
Val Arg Thr Lys Tyr Cys Ser Ser Leu Ser Cys Phe Ala Gly Phe Asp

 1   5   10   15
Ser

<210> 207
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<212> PRT
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<220>
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<400> 207
Trp Gly Gln Gly Thr Leu Val Thr Val Ser Ser
 1   5   10

<210> 208
<211> 23
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<213> Artificial Sequence

<220>
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<400> 208
Glu Ile Val Leu Thr Gln Ser Pro Ala Thr Leu Ser Leu Ser Pro Gly
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Glu Arg Ala Thr Ile Ser Cys
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<210> 209
<211> 15
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<220>
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<400> 209
Arg Ala Ser Glu Ser Val Asp Ser Tyr Gly His Ser Phe Met Gln
 1   5   10   15

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 1   5   10   15

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<400> 211
Arg Ala Ser Asn Leu Glu Pro
 1   5

<210> 212
<211> 23
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<400> 212
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Glu Arg Ala Thr Ile Ser Cys
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<210> 213
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<400> 213
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 1   5   10   15

<210> 214
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<400> 214
Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Arg Leu Leu Ile Tyr
 1   5   10   15

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Glu Ile Val Leu Thr Gln Ser Pro Ala Thr Leu Ser Leu Ser Pro Gly
 1   5   10   15
Glu Arg Ala Thr Ile Ser Cys
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<210> 220
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<400> 220

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Glu Arg Ala Thr Ile Ser Cys
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<210> 221
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<400> 221
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 1   5   10   15

<210> 222
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<400> 224
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Glu Arg Ala Thr Ile Ser Cys
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<400> 225
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 1   5   10   15

<210> 226
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<400> 226
Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Arg Leu Leu Ile Tyr
 1   5   10   15

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<400> 227
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Asp Arg Val Thr Ile Thr Cys
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<400> 229
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Asp Arg Val Thr Ile Thr Cys
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<210> 233
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<400> 233
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Asp Arg Val Thr Ile Thr Cys
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<210> 238
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<400> 238
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<210> 239
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<400> 239
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<210> 240
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 1   5   10   15
Asp Arg Val Thr Ile Thr Cys
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<400> 241
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<400> 242
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 1   5   10   15

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<400> 243
Glu Ala Ser Ser Leu Gly Arg
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<210> 244
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<400> 244
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 1   5   10   15
Asp Arg Val Thr Ile Thr Cys
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<400> 245
Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn
 1   5   10

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<400> 246
Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr
 1   5   10   15

<210> 247
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<400> 247
Ala Ala Ser Ser Leu Gln Ser
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<210> 248
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<400> 248

Gly Ile Pro Ala Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr
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Leu Thr Ile Ser Ser Leu Glu Pro Glu Asp Phe Ala Val Tyr Tyr Cys
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<210> 249
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<400> 249
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<210> 250
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<400> 250
Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg
 1   5   10

<210> 251
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<400> 251
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 1   5   10   15
Leu Thr Ile Ser Ser Leu Glu Pro Glu Asp Phe Ala Val Tyr Tyr Cys
            20   25   30

<210> 252
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<400> 252
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 1   5

<210> 253
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<400> 253
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 1   5   10

<210> 254
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<400> 254
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            20   25   30

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<400> 258
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<210> 259
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<400> 259
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<210> 260
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1 5 10 15
Leu Thr Ile Ser Ser Leu Glu Pro Glu Asp Phe Ala Val Tyr Tyr Cys
20 25 30

<210> 261
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<400> 261
Gln Gln Gly Asn Glu Val Pro Phe Thr
1 5

<210> 262
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<400> 262
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 1   5   10

<210> 263
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<220>
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<400> 263
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Leu Thr Ile Ser Ser Leu Gln Pro Asp Asp Phe Ala Ala Tyr Tyr Cys
            20   25   30

<210> 264
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<400> 264
Gln His Tyr Asn Thr Tyr Pro Tyr Thr
 1   5

<210> 265
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<400> 265
Phe Gly Gln Gly Thr Lys Leu Glu Ile Lys Arg
 1   5   10

<210> 266
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<212> PRT
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<400> 266
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Leu Thr Ile Ser Ser Leu Gln Pro Asp Asp Phe Ala Ala Tyr Tyr Cys
            20   25   30

<210> 267
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<400> 267
Gln His Tyr Asp Thr Tyr Pro Tyr Thr
 1   5

<210> 268
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<400> 268
Phe Gly Gln Gly Thr Lys Leu Glu Ile Lys Arg
 1   5   10

<210> 269
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<400> 269
Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr Glu Phe Thr
 1   5   10   15
Leu Thr Ile Ser Ser Leu His Pro Asp Asp Phe Ala Ala Tyr Tyr Cys
            20   25   30

<210> 270
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<400> 270
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<210> 271
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<400> 271

Phe Gly Gln Gly Thr Lys Leu Glu Ile Lys Arg
 1   5   10

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Leu Thr Ile Ser Ser Leu Gln Pro Asp Phe Ala Ala Tyr Tyr Cys
            20   25   30

<210> 273
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<400> 273
Gln His Tyr Ser Thr Tyr Pro Tyr Thr
 1   5

<210> 274
<211> 11
<212> PRT
<213> Artificial Sequence

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<400> 274
Phe Gly Gln Gly Thr Lys Leu Glu Ile Lys Arg
 1   5   10

<210> 275
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<220>
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Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys
            20   25   30

<210> 276
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<400> 276
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<210> 277
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<220>
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<400> 277
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 1   5   10

<210> 278
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<400> 278
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<210> 279
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<220>
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